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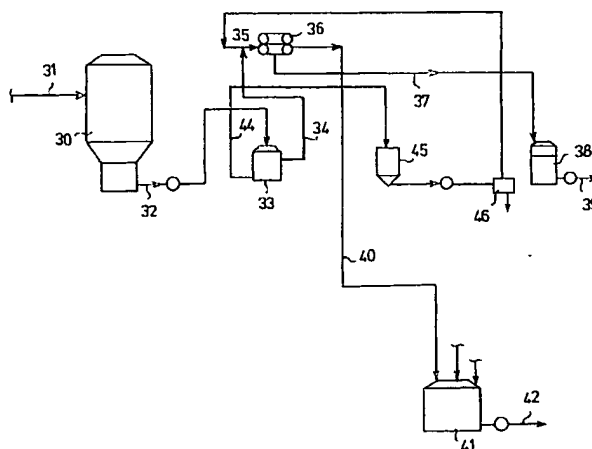
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(54) Title: METHOD AND DEVICE FOR HANDLING FILLER-CONTAINING BROKE IN A PAPER MACHINE AND A BOARD MACHINE



(57) Abstract: The invention relates to a method for handling filler-containing broke in a paper or board machine, in which method broke obtained from the paper or board machine and passed to a broke tower is treated. The broke is passed from the broke tower (30) to a screen (36), a fraction containing fillers and fines is separated from the broke by means of the screen (36) and this fraction containing fillers and fines is passed to be mixed with the stock to be fed to a headbox in the short circulation (50) of the paper or board machine. The invention also relates to a device for handling filler-containing broke in a paper or board machine which device (36) is placed after the broke tower (30) in a broke handling line. The device (36) is a screen (36) to separate a fraction containing fillers and fines from the broke for passing said fraction to be mixed with the stock to be fed to a headbox in the short circulation (50) of the paper or board machine.

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Method and device for handling filler-containing broke  
in a paper machine and a board machine

5 The invention relates to a method according to the preamble of claim 1.

The invention also relates to a method according to the preamble of claim 8.

The invention relates to a method and a device used in a paper or board machine  
10 in the handling of filler-containing broke.

Although the invention is described in the following mainly in connection with  
broke handling that takes place in a paper machine, broke handling that takes  
place in a board machine also falls within the scope of the invention.

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It is known from the prior art that broke created at different stages of the  
papermaking process is processed in order that it may be made use of in the  
process. It is also known from the prior art that the coating materials of coated  
broke created in the manufacture of coated paper are refined in connection with  
20 the treatment of broke, after which they can be used in the process.

As known from the prior art, the treatment of pulp in a paper machine is divided  
into different subprocesses, such as the treatment of virgin pulps including  
storage, refining and proportioning of virgin pulps, the short circulation including  
25 the transport of the stock to a headbox of a paper machine, and the handling of  
broke including storage, thickening and screening of broke. As known, paper  
machine broke contains, as mixed together, all raw materials used in the  
manufacture of paper, i.e. fibre material, both long and short fibre material, water,  
fillers, fines, pigments and additives. The raw materials used in the manufacture  
30 of paper as well as paper machine broke often also contain contaminants, which  
are mixed with the stock in different stages of processing. For this reason, in the

treatment of broke, in the treatment of stocks and in the short circulation, different screens or cleaners are often used for the removal of contaminants in order that the raw material used in manufacture should be as clean as possible. The present invention primarily relates to the handling of broke.

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Recently, in the manufacture of paper, increasing use has been made of multilayer headboxes to manufacture layered paper. For example, the stock is fed from a three-layer headbox to three layers, to two surface layers and to a middle layer between them, such that fines and fillers are fed to the surface layers to achieve  
10 desired properties for the surface layers of paper and, similarly, fibre material is usually mostly fed to the middle layer to achieve a desired middle layer structure. This manufacturing method is intended to be used in particular in printing paper and fine paper applications, for example, in connection with coated papers. The known systems for handling paper machine broke are, however, not advantageous  
15 for use in paper machines provided with multilayer headboxes. Here, the adverse factors include, among other things, the fact that the ash, pigment and fibre components in the different layers of paper are present in broke fully mixed with one another, so that in broke dosage they are not always returned to their optimal layer. In addition, in paper machines containing coated broke, pigments and ash  
20 material tend to separate in stock cleaners, in particular in hydrocyclone cleaning, wherefore their wastage is high. Alternatively, for the recovery of pigments and ash material it has been necessary to build recovery systems, which increase costs to a considerable extent. Thus, in paper machines based on a multilayer arrangement, all broke fractions are not passed in the known arrangements to their  
25 optimal layers in respect of paper quality. Also, paper machine broke mostly tends to be diluted during the treatment of paper machine broke in pulpers, wherefore it is also mostly necessary to dispose a so-called broke thickener in broke handling, which increases costs. In the arrangements known from the prior art there are thus problems in particular in the handling of coated broke and more particularly in the  
30 manufacture of coated paper in multilayer processes.

The appended figure 1 is a partial view of a process flowchart associated with the handling of coated broke in one known application in accordance with the prior art. As appears from the figure, in the arrangements of the prior art, coated broke is pumped from a coated broke tower to a screen, for example, a pressure screen, from where the accepted stream, i.e. accept, is passed to a separate chest, from where it is pumped to a paper machine. In this kind of arrangement, the handling of fillers and fines is rather complicated because the fillers and fines are always passed with the stock to the short circulation of the paper machine, in which they are separated with the reject (non-accepted stream) from hydrocyclones, so that it is only in the refining treatment that they can be broken up and they can be introduced into the process.

With respect to the prior art, reference is also made to *FI patent 105 488*, which discloses a method and an apparatus for processing filler-containing material, such as recycled fibres. In this known arrangement, the handling of coated broke is also rather complicated because it has been necessary to pass the fines and fillers with the stock to the short circulation of the paper machine, in which they are separated with the reject from hydrocyclones, so that it has been possible to break them up in the refining treatment, thus introducing them into the process.

Water that contains fillers and coating material is problematic in the handling of broke because its charge varies, with the result that chemical variations are caused in the papermaking process depending on the amount and type of broke.

With respect to the prior art relating to the invention, reference can also be made to the international patent application, publication No. *WO 00/50695* disclosing a method in which broke is fractionated such that its properties correspond to the properties of the stock which is fed and to which the fractionated broke is added. This known arrangement is mainly associated with the manufacture of board and it focuses in particular on the fractionation of fibres contained in broke.

One object of the invention is to provide an arrangement in which the drawbacks and disadvantages of the prior art arrangements have been eliminated or at least minimized.

- 5 Another object of the invention is to provide a method and a device for handling filler-containing broke having variable charge.

One special further object of the invention is to create a method and a device for handling coated broke in a paper and board machine that is suitable for use in particular in connection with multilayer processes.

With a view to achieving the objects described above as well as those coming out later, the method according to the invention is mainly characterized by what is set forth in the characterizing part of claim 1.

15 The device according to the invention is in turn mainly characterized by what is set forth in the characterizing part of claim 8.

In accordance with the invention, filler-containing broke, in particular coated broke, is pumped from a broke tower to a screen, from where the accept stream is passed either to a second screen or forwards in the papermaking process. The fillers and fines coming with wire water are separated from the broke by means of the screen/screens, which fines and fillers are passed forwards in the papermaking process to be mixed with the stock in the short circulation advantageously after hydrocyclones, from where they can be passed to the feed of a headbox, advantageously to the feed of a desired layer of a multilayer headbox.

In accordance with the invention, a device, for example, a screen is placed in the fractionation of broke, by which device the broke suspension is fractionated into two portions, firstly into a fines fraction containing, as enriched, ash, pigments and pulp fines as well as possibly short fibres, and into a coarse fraction

containing, correspondingly, a smaller quantity of the above-mentioned fines fractions and a larger quantity of fibre pulp and long fibres. In accordance with one advantageous feature of the invention, a desired fraction is passed from the fractionation of broke to a desired layer of a multilayer paper machine, for example, a fines fraction which also contains plenty of ash and pigment, to a surface layer. In addition to the screen used for fractionation, the broke line may advantageously also include a second screen or several screens for the removal of contaminants. The coarse fraction can be passed, for example, to the middle layer of paper or it can be mixed with some other stock to be fed to the paper machine.

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In connection with the invention, a filter, a washer or a pressure screen is advantageously used as a device that fractionates broke. In the filter, the pulp is thickened onto a wire cloth, so that the coarse fibre fraction is thickened when fines, ash and pigments are enriched in the filtrate. In this application, the level of fractionation can be controlled by means of the density of the selected wire, feed consistency, rotation speed or another technique known per se. In addition, in the washer it is possible to further improve the separation of fines by washing the stock and, correspondingly, the same type of fractionation result can be achieved, for example, by means of pressure screens by providing them with a suitable screen surface. Fines and ash pass through the screen surface more easily than fibres, and thickening of the coarse fibre fraction also occurs at the same time. The size of the device in accordance with the invention is about 30 % of the total stock stream. If arrangements in accordance with the prior art were used for this purpose, the size of the device would be about four- to fivefold.

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The various applications of the invention provide a number of advantages. Firstly, the different components of broke can be passed to a layer that is the most optimal in respect of paper quality, secondly, in a system that handles coated broke it is possible to pass the pigment which otherwise tends to separate in hydrocyclone cleaning steps either directly or through a desired treatment, for example, refining, to a desired layer of paper. In accordance with the invention, filler-containing

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water is recovered from the filtrate water and passed to a desired layer, for example, in a coating machine to a surface layer and in a non-coating machine to a middle layer. Further, as an advantage it may be mentioned that the fractionation device can also function as a thickener for thickening the coarse fraction, in which  
5 connection a separate broke thickener is not necessarily needed.

An original part of the invention is that broke is advantageously treated already at the stage at which the raw materials are at their very purest. By means of the invention, pigments and other important materials can be made use of and the  
10 water that is chemically the most difficult can be recovered. When needed, the fraction to be used can be subjected to retention and/or agglomeration before it is passed to a multilayer headbox and, when desired, the fraction can be adjusted to be suitable in its state, for example, by means of static mixers etc. When needed, the fraction can be passed to a chest to even out use.

15

The invention makes it possible to utilize consistency variations without disturbing the paper machine.

The invention is particularly suitable for use in connection with the manufacture  
20 of coated and filler-containing paper broke when handling coated and filler-containing broke. The invention is particularly suitable for the manufacture of coated paper in which the basis weight of base paper is 40 – 50 g and the weight of coated paper is about 80 – 100 g.

25 The broke used in the invention can be either broke of the paper machine in connection with which the invention is applied or the broke can be brought from somewhere else to the paper machine.

30 In the following, the invention will be described in greater detail with reference to the figures in the appended drawing, but the invention is not by any means meant to be narrowly limited to the details of them.

Figure 1 is a schematic view of one prior art application for handling filler-containing broke.

- 5 Figure 2 is a schematic view of an application of the invention for handling filler-containing broke.

Figure 3 is a schematic view of an arrangement of the short circulation in a paper machine in which a multilayer headbox and hydrocyclone fractionation are used.

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Figure 4 is a schematic view of an arrangement of the short circulation in a paper machine in a process in which a single layer headbox is used.

- As shown in Fig. 1, in the applications known from the prior art, coated broke coming from a paper machine has been passed along a duct 20 to a broke tower 10, in which it has been treated and from the broke tower 10 the coated broke has been pumped along a duct 21 to a screen 11, for example, a pressure screen, from where the accepted stream, i.e. accept, has been passed along a duct 26 to a chest 15, from where it is pumped to the paper machine along a duct 28. The reject from the screen 11, i.e. the non-accepted stream, has been passed along a duct 22 for treatment in other cleaning stages.
- 15
- 20

- In accordance with one application of the invention shown in Fig. 2, coated broke from a paper machine is passed along a duct 31 to a broke tower 30. From the broke tower 30 the coated concentrated coated broke is passed along a duct 32 to a screen 33, from where it is passed further along a duct 34 to a second screen through a duct 35, from where it is passed along a duct 37 to a chest 38, from where it is passed to the paper machine along a duct 39. There is also a duct 44 from the screen 33 for handling reject in a chest 45, from where it is passed further to further handling, point 46. The reject from the screen 33 is passed to the screen 46, whose accept is passed along the duct 35 to the second screen 36 to
- 25
- 30



produce a coated broke fraction in order to be passed further to the paper machine through the chest 38 and through the duct 37 situated before it and through the duct 39 situated after it.

- 5 In one application of the invention shown in Figs. 2 – 3, coated broke is pumped from the broke tower 30 to the first screen 33, whose accept stream is passed to the second screen 36, by means of which the fillers and fines coming with wire water are separated from the coated broke, which fillers and fines are passed forwards in the papermaking process to be mixed with the stock in the short
- 10 circulation 50 of the paper machine, advantageously after hydrocyclones. A coarser fraction from the screen 36 is passed to a chest 41, from where it is pumped forwards along a duct 42 for use as one of the components of thick stock 80.
- 15 Fig. 3 shows an arrangement of the short circulation 50 in a paper machine in which a multilayer headbox and hydrocyclone fractionation are used. Wire water 100 discharging from the wire section (not shown) of the paper machine is passed to a wire pit 55. In the wire pit 55, the thick stock 80 coming from stock preparation as well as an overflow 56 from a deaeration tank 51 are mixed with
- 20 the wire water. One component of the thick stock 80 can be constituted by the coarser fraction discharged from the screen 36. The mixed pulp suspension M is passed by means of a fan pump 57 to a hydrocyclone plant 58, the accept from the first stage of which is combined with the fines-containing fraction 39 produced in the handling of broke, and passed along a duct 59 to the deaeration tank 51. From
- 25 the deaeration tank 51 the stock suspension M is passed along a duct 52 to the surface layers of a headbox 70 through pumps 53 and machine screens 54. The accept from the second stage of the hydrocyclone plant 58 is passed along a duct 60 to the middle layer of the headbox 70 through a pump 53 and a machine screen 54. The coarser fraction obtained from the screen 36 along a duct 43 can be added
- 30 to the second stage accept of the hydrocyclone plant 58. The arrangement shown in Fig. 3 enables the surface layers of paper to be provided with plenty of fillers

and fines, whereby better printability is achieved for the paper, and the middle layer to be provided with longer fibres, which impart more strength to the paper.

Fig. 4 shows an arrangement of the short circulation 50 in a paper machine in a process which uses a single layer headbox. Wire water 100 discharging from the wire section (not shown) of the paper machine is passed to a wire pit 55. In the wire pit 55, thick stock 80 coming from stock preparation as well as an overflow 56 from a deaeration tank 51 are mixed with the wire water. The mixed pulp suspension M is passed by means of a fan pump 57 to a hydrocyclone plant 58, whose accept is combined with the fines-containing fraction 39 produced in the handling of broke, and passed along a duct 59 to the deaeration tank 51. From the deaeration tank 51 the stock suspension M is passed along a duct 52 to a headbox 75 through a pump 53 and a machine screen 54. The fines-containing fraction 39 can also be mixed with the stock suspension also after the deaeration tank, for example, before the machine screen 54.

The feed consistency in the broke tower is about 3.5 %. The dosage of broke is, for example, about 30 %, which corresponds to about 10 % of the flow rate of the headbox of the paper machine. On a coating machine, efficiency is usually 60 – 80 % and shutdowns take 10 % and the rest about 20 – 30 % of paper is passed to broke on the machine or as breaks, i.e. in total production about 30 – 40 % passes through the handling of broke. In the arrangement in accordance with the invention, about 27 % can be brought to treatment, when about 10 % of the headbox stream is brought up. About 10 – 30 % of production comes through broke and about 20 – 50 % of this broke is fillers and ash. The arrangement in accordance with the invention is operative when there is about 10 % of fillers, i.e. it is applicable when newspapers, dip and layered papers are manufactured. The invention makes it possible to recover filler pigments, fines and short fibres and they can be used optimally in the papermaking process.

30

## Claims

1. A method for handling filler-containing broke in a paper or board machine, in which method broke obtained from the paper or board machine and passed to a broke tower is treated, **characterized** in that the broke is passed from the broke tower (30) to a screen (36), that a fraction containing fillers and fines is separated from the broke by means of the screen (36), that this fraction containing fillers and fines is passed to be mixed with the stock to be fed to a headbox in the short circulation (50) of the paper or board machine.
2. A method as claimed in claim 1, **characterized** in that coated broke is treated in the method.
3. A method as claimed in claim 1 or 2, **characterized** in that, in the method, the fraction containing fines and fillers is passed to be mixed with the stock to be fed to a desired layer of a multilayer headbox in the papermaking process.
4. A method as claimed in claim 3, **characterized** in that the fraction containing fines and fillers is passed to be mixed with the stock to be fed to the surface layers of the multilayer headbox.
5. A method as claimed in any one of the preceding claims, **characterized** in that the fraction containing fillers and fines is passed to be mixed with the stock in the short circulation (50) of the headbox after hydrocyclones (58).
6. A method as claimed in any one of the preceding claims, **characterized** in that a coated broke suspension obtained from the paper machine is fractionated by means of the screen (36) into at least two portions, firstly, into a fines fraction containing, as enriched, ash, pigments and pulp fines as well as possibly short fibres and, secondly, into a coarse fraction mainly containing fibre pulp and long

fibres, and that the separated broke fractions are passed to a desired feed of a multilayer headbox used in the papermaking process.

7. A method as claimed in any one of the preceding claims, **characterized** in that  
5 a second screen (33) is used in the method for removing contaminants.
8. A device for handling filler-containing broke in a paper or board machine, which device (36) is placed after a broke tower (30) in a broke handling line, **characterized** in that the device (36) is a screen (36) to separate a fraction  
10 containing fillers and fines from the broke for passing said fraction to be mixed with the stock to be fed to a headbox in the short circulation (50) of the paper or board machine.
9. A device as claimed in claim 8, **characterized** in that the device (36) is a  
15 device that treats coated broke.
10. A device as claimed in claim 8 or 9, **characterized** in that the device (33) is connected with the feed (53, 54) of a desired layer of a multilayer headbox through at least one duct (34, 37, 39).  
20
11. A device as claimed in claim 8, **characterized** in that the device (33) is connected with the short circulation (51) of the headbox after hydrocyclones (58).
12. A device as claimed in any one of claims 8 to 11, **characterized** in that the  
25 device (33) is connected with a screen (36) through a duct (34) for removing contaminants.
13. A device as claimed in any one of claims 8 to 12, **characterized** in that the device (33) is a filter, a washer or a pressure screen.

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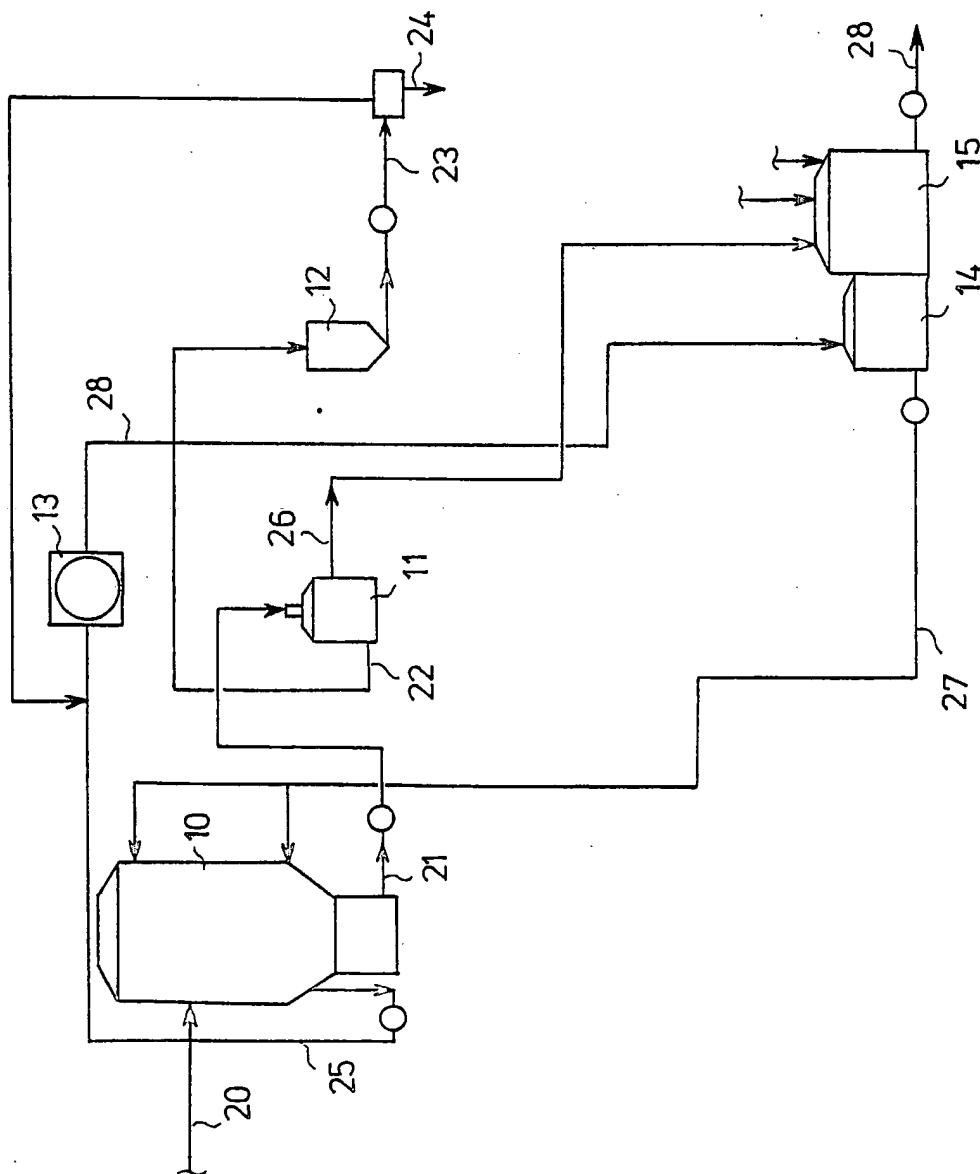
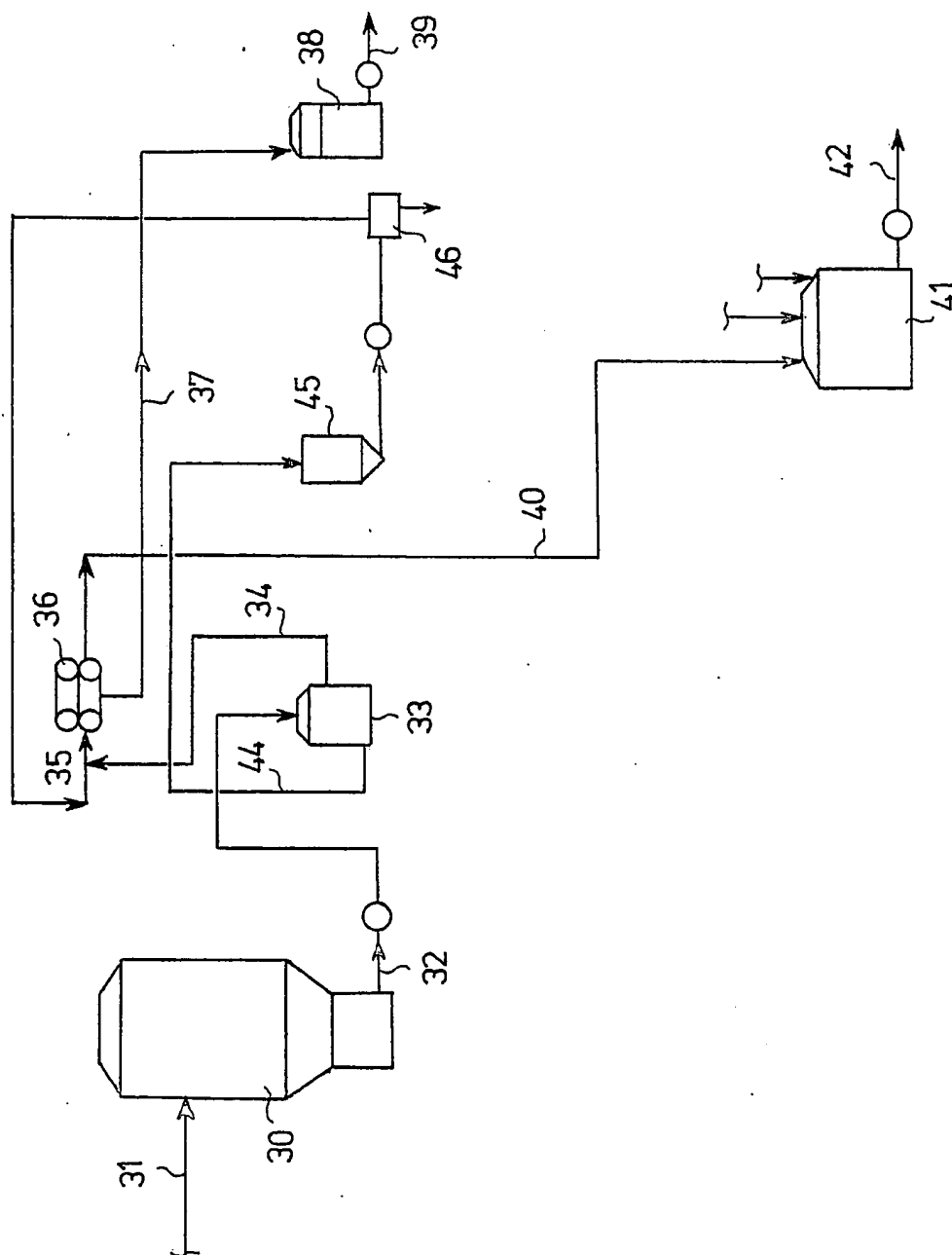


FIG. 1  
PRIOR ART



**FIG. 2**

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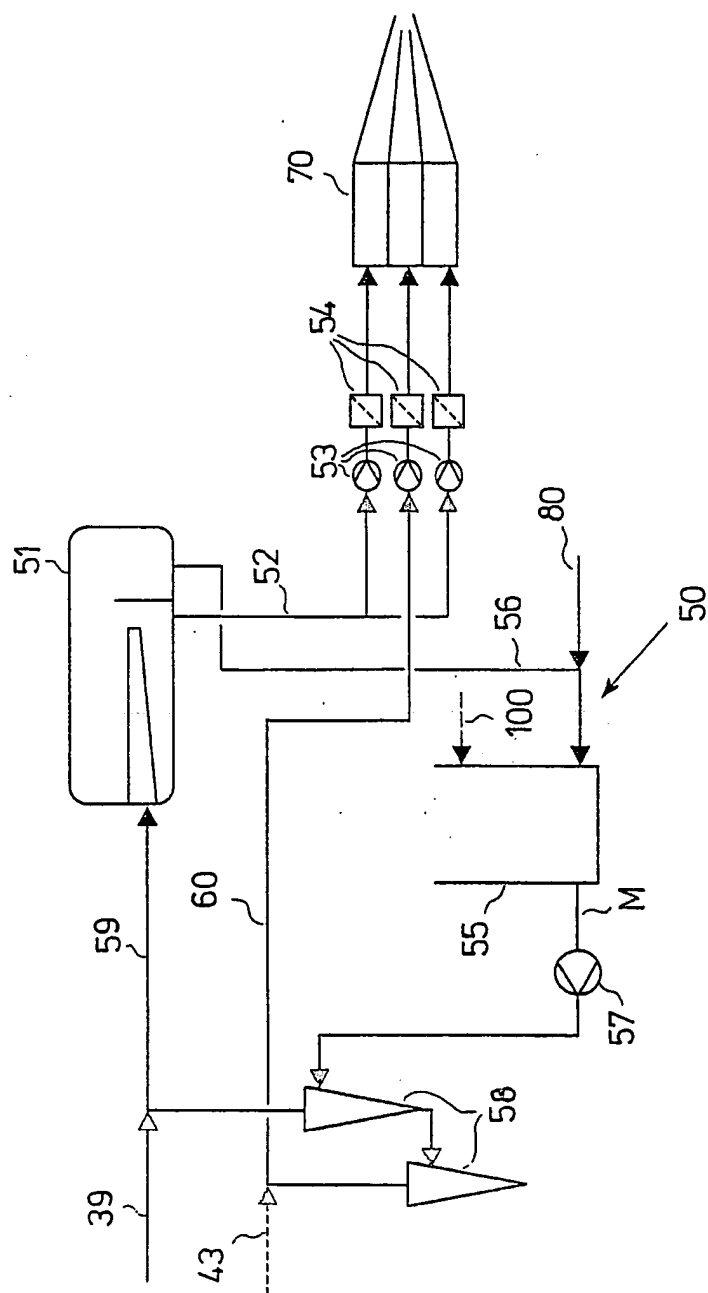


FIG. 3

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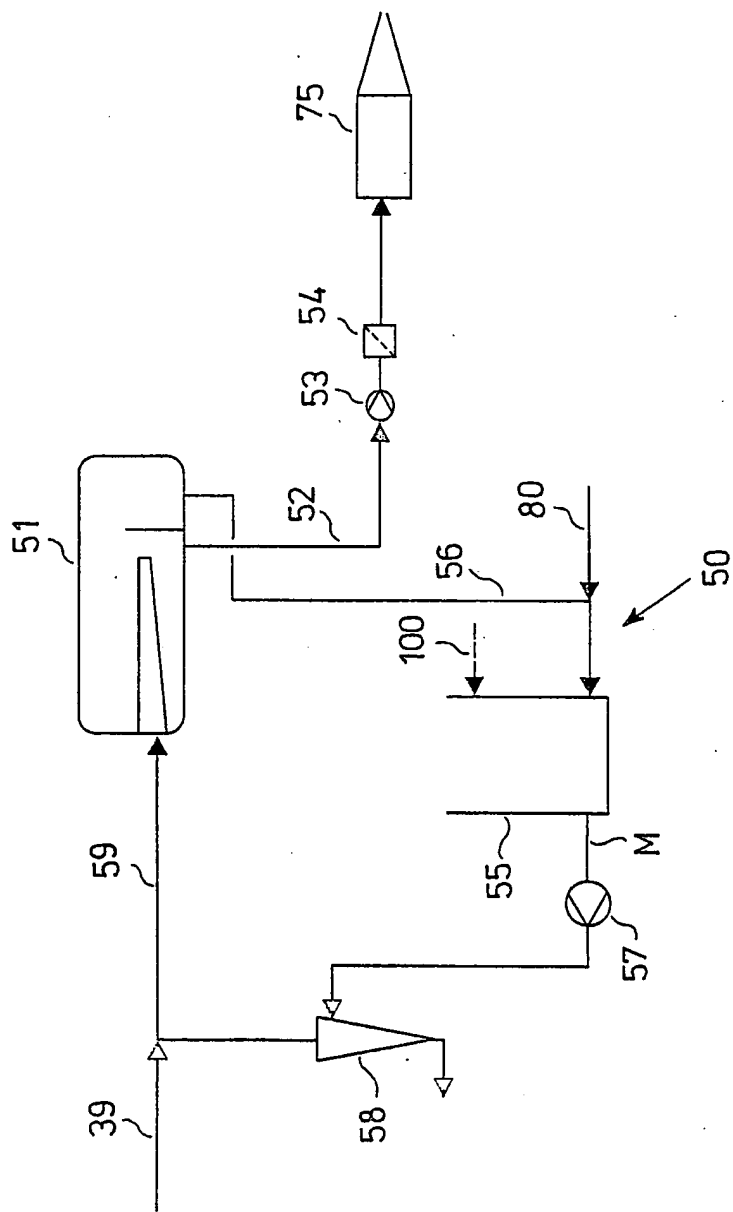


FIG. 4



## INTERNATIONAL SEARCH REPORT

International application No.

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## A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21D, D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9946442 A1 (AHLSTROM MACHINERY OY), 16 Sept 1999 (16.09.1999), page 2, line 3 - page 3, line 7; page 8, line 16 - page 9, line 17; page 11, line 18 - line 24, figure 2, abstract --	1-13
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A	WO 9504189 A1 (A. AHLSTROM CORPORATION), 9 February 1995 (09.02.1995), page 1, line 1 - page 2, line 21, claims 1-12, abstract --	1-13

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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International application No.

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT  
Information on patent family members

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